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NOTES ON CARANGIN FISHES

VI.—EAST INDIAN MACKEREL SCADS (*DECAPTERUS*) DESCRIBED AND DIFFERENTIATED

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Early in 1942 The American Museum of Natural History received a collection of carangin fishes of the genus *Decapterus* from the Instituut v. d. Zeevisserij, at Batavia, numbering some 100 specimens from Java and thirty-five from Celebes. Fishes of this genus occur cosmopolitan in warm seas but seem to be particularly abundant in East Indian waters.

Decapterus is closely related to *Caranx* and *Trachurus*, characterized by complete separation of the last dorsal and anal rays from the rest of the fin to form a single finlet. (Such finlets are characteristic of the Scombridae and occur in only a few Carangidae.) Undifferentiated lateral-line scales (in advance of the characteristic carangin scutes) are not larger than body scales, as sometimes stated, but are more persistent, frequently remaining when these others have been lost. A number of forms of *Decapterus* are recognized, forming an evolutionary series, increasingly long bodied, cylindrical, mackerel-like, with small mouth, reduced teeth, reduced scutes on the straight part of the lateral line, shorter pectoral. These characters seem to be adaptations to wide-ranging off shore life. *Decapterus maruadsi* of Japan stands near the basal end of the series, *D. macarellus* of the Atlantic at the terminal end. Species from the two ends are quite unlike; thus it is impossible to confuse *punctatus* and *macarellus* from the Atlantic coast of America, *maruadsi* and *pinnulatus* recorded from the Hawaiian Islands. Where more related forms occur together, as they do in the Orient, it becomes difficult to differentiate them. The present collection leads me to believe that there is also appreciable variation

between more or less local populations or schools, as well as intergrading, to make it still more difficult.

Young *Caranx* as a rule pass through a deep bodied stage, later becoming more slender, though their body may become somewhat deeper again at a large size as is normal with fishes. I have not so far found evidence of deeper body in young of this genus, at least down to 70 mm. standard length. Its terminal members particularly show considerable change in body form as they grow large. The body becomes wider and deeper, particularly at about the origin of the soft dorsal; the fish more spindle-shaped, so that large specimens of related forms may resemble one another superficially more than they do their own young.

Temminck and Schlegel, 1844, recognized two species of *Decapterus* from Japanese seas, *maruadsi* and *muroadsi*, a basal and terminal member of the genus. Wakiya, 1924, recognized six. With the present East Indian collection to hand I believe at least five of the six are valid (whether or not rightly named), including two which I placed in the synonymy of a third in 1936 (Amer. Mus. Novitates, No. 835, p. 3). Wakiya probably had ample material before him. He divides the genus on details of more or less rudimentary dentition, a difficult character, and one in which I have no great confidence. Weber and de Beaufort, 1931, recognize four species from the East Indies, of which they had seen only two, one more or less basal and one more or less terminal. In reviewing the genus, Norman, 1935, recognizes four species from the East Indies by implication, but lists only twenty-

six specimens, mostly from elsewhere, on which his descriptions of these are based.

Our Java, Celebes collection comprises at least four distinct forms, to identify which correctly involves difficult problems of nomenclature. Bleeker described species from East Indian waters which are not easy to place, and Wakiya, in identifying Japanese material with them, may have been misled by local population variations. Weber and de Beaufort and Norman have followed him, more or less, with little East Indian material for reference.

The descriptions which follow are based entirely on this East Indian collection and a few supplementary Japanese specimens examined as stated. A certain amount of population variation is to be expected, especially at distant localities. In counting scutes of the posterior part of lateral line (which I consider a significant character) it is difficult to escape the personal equation. In front these pass gradually into undifferentiated lateral-line scales, behind into small, narrow, pointed scales on the base of the caudal fin, which are not properly of the lateral line. There are more or less enlarged scales in front with no definite trace of a keel, and small pointed ones behind, which have not been counted as scutes. In preserved material of this genus, rays of the vertical fins are often difficult to count, and there were very likely errors in some 170 counts made, but not such as to alter materially the range or average number of rays. Depths are standard (to base of caudal) throughout.

Decapterus maruadsi kurroides

Bleeker

Decapterus kurroides BLEEKER, 1885, Nat. Tijds. Ned. Ind., VIII, p. 420; Amboina.

I place here three specimens, two from Amboerang, North Celebes, September 23, 1941, the third with label lost, probably also from there or thereabouts.

They have the distinguishing characters of Japanese *maruadsi*, relatively deep, compressed body, relatively strong scutes, extending the entire length of the straight part of lateral line, and long pectoral. They differ from *maruadsi* notably in

fewer fin rays and larger eye. It will be noted (beyond) that the oriental race of *D. macarellus* also has fewer fin rays in the Indies than in Japan.

Length to base of caudal, 150 to 195 mm. Depth in this length, 3.8 to 4.3 (average 4.07); head, 3.2 to 3.4 (3.33). Eye in head, 3.5; maxillary, 2.5 to 2.7 (2.6); width of body, 2.1 to 2.2 (2.17); pectoral, 1. Straight part of lateral line in the chord of its curve, 1.3 to 1.5 (1.4). Scutes occupy the entire length of the straight part with 2 or 3 extending onto the curve.

Dorsal soft rays, 27 to 28 (27.3) [29]-1; anal, 20 to 24 (22.3)-1; 54 to 56 (55) scales in the lateral line, followed by [30] 33 to 34 (33.7) scutes, total 87 to 90 (88.7).

Scales on top of the head extend to opposite the front rim or front part of eye. The occipital triangle, without scales in all but large *D. scombrinus*, but usually scaled, seems to have had only a few scales, anteriorly. Lower jaw well projecting; teeth in jaws small but more or less noticeable. The end of the maxillary is slightly concave; the line of its edge carried upward would extend toward the front rim of the eye or of pupil (see beyond under *lajang*).

The field labels of these specimens are marked "malaloegis massoeah," whereas those of aberrant *D. russellii* from nearby Menado are marked "malaloegis passir."

Ray and scute counts in brackets are Bleeker's for *kurroides* where these differ from our three specimens. His descriptions of members of this genus are difficult to identify (see beyond under *lajang*, p. 5), but it is likely he recognized the same forms we do.

Decapterus dayi Wakiya from Formosa is probably an intermediate from Japanese *maruadsi* toward this fish we identify with *kurroides*, but as it is much closer to the former than the latter, this name would not be available for same in any event. Its slightly shorter pectoral is probably due to its being a smaller fish. I cannot agree with Wakiya that Day's figure of *kurra* is his *dayi*, as it looks too much like our *D. russellii*, of which there is ample material.

***Decapterus russellii* (Rüppell)**

Caranx russellii RÜPPEL, 1828, Fische roth. Meers, p. 99; Red Sea.

Decapterus russellii[i], WAKIYA, 1924, Ann. Carn. Mus., XV, p. 149, Pl. xv, fig. 2; Japan.—WEBER AND DE BEAUFORT, 1931, Fishes Indo-Austr. Archipel., VI, p. 196, Fig. 41; East Indies.—NORMAN, 1935, Ann. Mag. Nat. Hist., (10) XVI, p. 258; Red Sea to Australia and Japan.

This form is of moderate depth, little compressed; mouth rather large, teeth small, those in the lower jaw largest, barely or not appreciable without a glass; scutes occupying the whole straight part of lateral line, sometimes a scale or two short of this or a scute or two on the curve; and the pectoral is rather long.

Sixty-seven specimens from Batavia, East Java (Banjoewangi) and South Celebes (Bero Masidi) are rather consistent and little variable as compared with other oriental forms of this genus. They have the lower jaw appreciably projecting, end of the maxillary squarish to concave, usually slightly concave. Dorsal soft rays, 27 to 31-1, average 28.7-1 (47 specimens); anal 24 to 28-1, average 25.6-1 (25 specimens). Occipital triangle scaled at 90 mm. and upward. Color dark above to mid line, and on chin, pale below and on sides of head, little contrasted, no dark specks on side. A dark opercular spot, and often a dark area on the axil of pectoral.

Lengths to base of caudal, 68 to 90 mm. (5 specimens). Depth in this, 4.7 to 5 (average 4.84); head, 3.5 to 3.6 (3.52). Eye in head, 3 to 3.6 (3.28); maxillary, 2.5 to 2.6 (2.56); width of body, 2.2 to 2.4 (2.32); pectoral, 1.3 to 1.5 (1.42). Straight part lateral line in chord of the curve, 1.5 to 1.6 (1.56). Fifty-nine to 62 (60.4) scales, followed by 29 to 34 (32.6) scutes, totaling 88 to 95 (93.0). The line of the end of the maxillary projected upward, extends toward the front part of eye or front rim of pupil. Inside of gill-cover palish.

Lengths, 111 to 125 mm. (27 specimens critically examined). Depth, 4.6 to 5.3 (average 4.88). Maxillary, 2.5 to 2.7 (2.54); width, 2.2 to 2.6 (2.37); pectoral, 1.1 to 1.3 (1.20). Fifty-four to 64 (59.4) scales, followed by 29 to 36 (32.8) scutes,

totaling 86 to 98 (92.0). Maxillary to under front of eye, the line of its end, or the longest limb of same when concave, projected upward, extends toward the front rim of eye or pupil, in only one case toward before eye. Scales on top of head extend to over hind part of eye or of pupil, not to middle of eye.

Five representative specimens of 111 to 122 mm. have head, 3.4 to 3.5 (average 3.5). Eye, 3.1 to 3.5 (3.3). Straight part of lateral line in curve, 1.4 to 1.6 (1.5). Inside gill cover more or less dusky.

Lengths, 130 to 146 mm. (8 specimens). Depth, 4.2 to 4.4 (average 4.3); head, 3.4 to 3.6 (3.5). Eye, 3.2 to 3.5 (3.4); maxillary, 2.5 to 2.6 (2.56); width, 2 to 2.3 (2.1); pectoral, 1.1 to 1.2 (1.14). Straight part lateral line in curve, 1.3 to 1.5 (1.4). Fifty to 61 (57) scales, followed by 33 to 38 (35) scutes, totaling 87 to 98 (92). Maxillary to under or just short of front rim of eye; longest limb of its slightly concave hind end toward front rim of eye or of pupil. Scales on top of head to about opposite hind rim of pupil. Inside gill-cover somewhat dusky to blackish.

Lengths, 157 to 190 mm. (8 specimens). Depth, 4.2 to 4.5 (average 4.36); head, 3.5 to 3.6 (3.5). Eye, 3.6 to 3.7 (3.6); maxillary, 2.5 to 2.8 (2.64); width, 2 to 2.2 (2.05); pectoral, 1.1 to 1.2 (1.12½). Straight part lateral line in curve, 1.2½ to 1.5 (1.4). Fifty-four to 62 (57.5) scales, followed by 29 to 35 (32.1) scutes, totaling 86 to 95 (89.6). Maxillary just falling short of or to under front part of eye, line of its end directed toward front eye rim to pupil rim, or in one case where the end is oblique, toward front part of pupil. Scales on top head to opposite hind rim of pupil or mid eye. Inside gill-cover dusky except a narrow pale margin.

Contrasted with the uniformity of these sixty-seven specimens, one of 140 mm., three of 173 to 193 mm. from Menado, North Celebes, September 21, 1941, provisionally referred to this form, are more slender and variously abnormal.

The one of 140 mm. is normal for *russellii* examined, in having scutes on the whole length of the straight part of lateral line, 61 scales followed by 32

scutes, total 93. Scales on top of head to opposite hind part of eye, the occipital triangle with small scales (except at tip). Pectoral, 1.2. Anal soft rays, 26-1. Line of the end of the maxillary toward front part of eye. Inside gill-cover dusky and pale.

It is aberrant in being more slender, abnormal in having the maximum number of dorsal rays and maximum width, a short maxillary with a straight hind edge, jaws about equal without noticeable teeth, approaching the more slender specimens of Japanese *muroadsi* which in turn approach Japanese *macrosoma*, in these respects; also abnormal in most of its measurements. Depth, 5.4; head, 3.7. Eye, 3.6; maxillary, 2.7; width, 2. Straight part lateral line in curve, 1.6. Dorsal soft rays, 31-1.

The three larger specimens (173 to 193 mm.) have depths, 4.6 to 5 (average 4.8); head, 3.6 to 3.8 (3.73). Eye, 3.5 to 4.2 (3.8); maxillary, 2.7 to 3 (2.8); width, 1.9 to 2 (1.97); pectoral, 1.2 to 1.3 (1.23). Straight part lateral line in curve, 1.4 to 1.6 (1.5). Dorsal soft rays, 28 to 31 (29.3)-1; anal, 25 to 26 (25.7)-1. There are 57 to 64 (60) scales followed by 30 to 37 (32) scutes, total 90 to 94 (93).

The most aberrant of the three is one of 180 mm. Like the other two it has the scales and scutes, which occupy the length of the straight part of lateral line, normal. Scales on top of head extend only to hind part of eye, but those on the occipital triangle are few or lost. It is the most slender (depth 5), with the smallest head and eye (3.8, 4.2), smallest maxillary (3), straight part lateral line in curve, 1.6; dorsal soft rays, 31-1. End of maxillary squarish, no noticeable teeth.

This specimen is exceedingly like that of 140 mm. with the same data, also very like a larger one figured by Norman from Muscat (1935, Ann. Mag. Nat. Hist., (10) XVI, Fig. 3, p. 260) as *kiliche*, except that the latter shows scutes slightly less developed. It may be noted that *kiliche*, Norman is not *kiliche* Cuvier and Valenciennes; that Norman tentatively identifies *kurroides* Bleeker with his *kiliche*, which tends toward the terminal (*macar-*

ellus) group from *kurra* (equals *russellii*), whereas I make *kurroides* conspecific with the more basal *maruadsi*.

Decapterus lajang Bleeker

Decapterus lajang BLEEKER, 1885, Nat. Tijds. Ned. Ind., VIII, p. 302; Ternate.—WAKIYA, 1924, Ann. Carn. Mus., XV, p. 155, Pl. XVII, fig. 1; Japan.

Not *Decapterus lajang*, NORMAN, 1935, Ann. Mag. Nat. Hist., (10) XVI, p. 261; Durban; which seems to be a race of *macarellus*.

This form is variably elongate, little compressed; mouth smaller, teeth not appreciable without a glass; scutes occupying more than half but less than the entire straight part of the lateral line. Wakiya has pointed out and figured a peculiarity in the shape of the end of its maxillary as compared with related forms. The maxillary of *D. m. macrosoma* ends in a clean straight line slanting upward and backward; that of *D. muroadsi* is similar but the line of its end is more vertical and squarish; that of *D. lajang* is rounded and expanded backward at the lower corner so that its hind edge is more or less concave. In *D. russellii* the hind end of the maxillary is also usually slightly concave but not rounded backward at the lower corner in this manner. Another character of *D. lajang* is that scales on top of the head do not extend so far forward as in related forms, not so far as opposite middle of the eye in any specimen examined.

Thirty-seven specimens from Java (most or all from Batavia), are very variable, and four additional from North Celebes are in no way distinctive. They have the lower jaw only slightly projecting, maxillary about to under front rim of eye. Dorsal soft rays 30 to 36-1, average 32.7-1 (23 specimens). Anal 25 to 29-1, average 27.2-1 (24 specimens). Occipital triangle scaled at 117 mm. and upward. Color of preserved material much as in *D. russellii*, but sometimes darker above, more contrasted with the pale lower parts. In the single 72 mm. specimen dark specks are present on the side as in small *macrosoma*; from 117 to 130 mm. they are usually entirely absent, sometimes a few below the eye; above that size they are absent. Up

to 155 mm. inside of gill-cover is palish to dusky; in the largest East Indian and a larger Japanese specimen it is pale or palish, but these are badly faded.

Length to base of caudal, 72 mm. (1 specimen). Depth in this, 5; head, 3.7. Eye in head, 4; maxillary, 2.6; width of body, 2.5; pectoral, 1.9. Straight part lateral line in chord of curve, 1.5. Part occupied by scutes in entire straight part lateral line, 1.6. Twenty-seven scutes. The line of the longest limb of the slightly concave end of maxillary, projected upward, extends toward the front rim of the eye. No appreciable scales on top of head.

Lengths, 117 to 130 mm. (9 specimens). Depth, 5.2 to 5.8 (average 5.5); head, 3.5 to 3.9 (3.69). Eye in head, 3.5 to 4.2 (3.70); maxillary, 2.5 to 2.8 (2.64); width, 2.2 to 2.4 (2.24); pectoral, 1.5 to 1.7 (1.6). Straight part lateral line in curve, 1.1 to 1.4 (1.26). Scutes in straight part, 1.3 to 1.7 (1.55). 78 to 87 (82) scales, followed by 28 to 32 (31) scutes, totaling 106 to 118 (113). Longest limb of the hind end of maxillary extending toward before eye or the front rim of eye. Scales on top of the head extend forward to the hind part of eye, or behind eye.

Lengths, 140 to 155 mm. (13 specimens critically examined). Depth, 4.8 to 5.6 (average 5.3); head, 3.6 to 3.9 (3.75). Eye in head, 3.7 to 4.4 (3.95); maxillary, 2.5 to 2.9 (2.7); width, 2 to 2.4 (2.1); pectoral, 1.3 to 1.6 (1.5). Straight part lateral line in curve, 1.2 to 1.6 (1.38). Scutes in straight part, 1.2 to 1.8 (1.5). 75 to 86 (80) scales, followed by 25 to 34 (30) scutes, totaling 95 to 115 (109). Longest limb of hind end of maxillary toward before eye or front rim (front part in one case) of eye. Scales on top of head extend to behind the eye in the center, hind part of eye at the sides.

Length, 185 mm. (1 specimen). Depth, 5.1; head, 3.8; eye, 4; maxillary, 2.9; width, 1.9; pectoral, 1.7. Straight part lateral line in curve, 1.5. Scutes in straight part, 1.4. Eighty to 83 scales followed by 25 to 26 scutes, totaling 106 to 108. End of maxillary squarish toward front rim of eye on one side, slightly concave toward

before eye on the other. Scales on top of head to opposite hind part of eye.

The great variability in dorsal rays, in depth and in the proportion of straight part of lateral line occupied by the scutes, even within the two size groups for which several specimens are to hand (nine in one case, over thirteen in the other), suggests that this form may be heterozygous. In these characters as in certain others it lies between *D. russellii* and the *D. m. macrosoma* (tending toward *D. m. pinnulatus* of the Pacific), as described from Japan.

There is some question whether *lajang* and *macrosoma* of Bleeker have been correctly identified and not transposed. His *macrosoma* was the more slender with more numerous dorsal rays, and in these respects differs from our *macrosoma* material, whereas either of his forms is all right for our variable *lajang* material. Wakiya, working with *macrosoma* intermediate toward *pinnulatus*, may have been misled and followed by other authors. On the other hand it is possible that Bleeker had similar intermediate *macrosoma*, though its type locality, Batavia, would make this seem unlikely. It would only cause confusion to undertake a thorough nomenclatural revision of East Indian forms of *Decapterus* here, so I leave this to the judgment of my colleagues of the Instituut v. d. Zeevisserij, whose fishes they are, at least for the time being, in the hope that they will soon once more be in a position to give the matter their attention.

There is a single larger specimen (in poor condition) of *D. lajang* from Japanese waters, presented to the American Museum by Mead Johnson and Company. This shows further age changes from East Indian material to hand but is also aberrant in one or two characters even for that variable form. It has an exceptionally wide body and more scales preceding the scutes in the lateral line. Quite likely the East Indian and Japanese populations of *lajang* differ somewhat.

Length, 260 mm. Depth, 4.7; head, 4. Eye, 4.2; maxillary, 3; width, 1.6; pectoral, 1.3. Straight part in curve

lateral line, 1.4. Scutes in straight part, 1.7. Dorsal soft rays, 30–1; anal, 27–1. Ninety-four scales followed by 25 scutes, total 119. End of maxillary concave, longest limb toward before eye. Occipital triangle scaled; scales on top of head to opposite hind part of eye. Body deepest at front of soft dorsal but widest back of head, instead of both deepest and widest at front soft dorsal as in the 185 mm. specimen and in large *macrosoma* (see beyond).

Decapterus muroadsi
(Temminck and Schlegel)

Caranx muro-adsii TEMMINCK AND SCHLEGEL, 1844, Faun. Japon., p. 108, Pl. LVIII, fig. 2; Japan.

Decapterus muroadsi, WAKIYA, 1924, Ann. Carn. Mus., XV, p. 152, Pl. XVI, fig. 1; Japan.

This form, "common along the warmer coast of Japan proper" but "not yet known from the south beyond that region" (Wakiya), is of the same evolutionary level as, and closely related to, the preceding (*lajang*). It has similar small mouth, mandible little projecting, teeth not appreciable, and (unlike *D. scombrinus* of the eastern Pacific) occipital triangle scaled. It differs notably from *lajang* in having the end of the maxillary squarish, not appreciably if at all concave, scales on top of the head extending further forward.

I find four specimens 220 to 270 mm., standard length in the American Museum collections (No. 13056), from Kagoshima Bay, Japan, Wakiya, 1922. The pectoral becomes longer than that of *lajang* at this size. Though in other respects these specimens are reasonably uniform, they vary notably in depth, suggesting a composite population. Thus the largest of 270 mm. is the most slender (depth, 5.6), whereas it should be the deepest. The second largest, of 235 mm., is much deeper (4.7). The two smallest, of 220 and 230 mm., have depth 5.5, and assuming the others to be of the same population with the same heritage one would expect the 235 mm. specimen to have a depth over 5, the 270 mm. one a depth under 5.3.

I refer two small specimens from Menado, North Celebes, to *D. muroadsi*.

They have a squarish, subvertical end to the maxillary which is not concave, as has *muroadsi*; scalation on top of head seems to extend to opposite hind part of eye. It is possible they are aberrant *lajang*, and reference of *muroadsi* to the East Indies on the basis of these specimens is no more than tentative. It is likely that the two forms intergrade. There is also some doubt in the determination of a badly preserved Japanese specimen 135 mm. long in the American Museum collections (No. 889). All have the shape of the end of maxillary similar to that in the larger unquestionable *D. muroadsi* (above), and the largest of the latter has the maxillary on one side (not on the other) slightly concave. The figures given below are mainly of this Japanese material examined, whereas those for the other species are based on East Indian material.

Length to base of caudal, 93 to 100 mm. (2 specimens from North Celebes). Depth in this, 5.4 to 5.6 (average 5.5); head, 3.8 to 4.1 (3.95). Eye in head, 3.7 to 3.8 (3.75); maxillary, 2.6 to 2.7 (2.65); width, 2.2 to 2.5 (2.35); pectoral, 1.6 to 1.7 (1.65). Straight part lateral line in curve, 1.3 to 1.6 (1.45); scutes in straight part, 1.5 to 1.7 (1.6). Dorsal soft rays, 30 to 34 (32)–1; anal, 25 to 27 (26)–1. Eighty-two scales (one specimen), followed by 27 to 30 (28.5) scutes; total, 109 to 112 (110.5). Line of end of maxillary toward front rim or front part of eye. Scales on top of head seemingly to under hind part of eye. Inside of gill-cover dusky, to dusky behind.

Length, 135 mm. (1 specimen). Depth, 5.1; head, 3.7. Eye, 4; maxillary, 2.5; width, 2; pectoral, 1.5. Straight part lateral line in curve, 1.2; scutes in straight part, 1.7. Dorsal soft rays, 33–1; anal, 27–1. Eighty-five scales followed by 30 scutes, total 115. Line of end maxillary toward front part of eye. Scales top of head to opposite hind part of eye. Inside gill-cover pale.

Lengths, 220 to 270 mm. (4 specimens). Depth, 4.7 to 5.6 (average 5.3); head, 3.9 to 4.2 (4.1). Eye, 3.9 to 4.5 (4.15); maxillary, 2.7 to 3 (2.9); width, 1.8 to 1.9 (1.85); pectoral, 1.1 to 1.2 (1.12½). Straight part in curve lateral line, 1.2 to

1.5 (1.4); scutes in straight part, 1.4 to 1.5 (1.45). Dorsal soft rays, 28 to 33 (30)-1; anal, 25 to 27 (26)-1. Eighty-three to 88 (86) scales, followed by 29 to 33 (31) scutes, totaling 115 to 118 (116). Line of end of maxillary toward front part of eye or front rim of pupil. Scales on top of head to opposite front part of eye. Inside gill-cover dusky, at least behind.

***Decapterus macarellus macrosoma*
Bleeker**

Decapterus macrosoma BLEEKER, 1851, Nat. Tijds. Ned. Ind., I, p. 358; Batavia.—WAKIYA, 1924, Ann. Carn. Mus., XV, p. 153, Pl. xvi, fig. 2; southern Japan and Bonin Ids. (intermediate toward *D. m. pinnulatus* of Hawaii).—?NORMAN, 1935, Ann. Mag. Nat. Hist., (10) XVI, p. 262; East Indies and Philippines.

As in other races of *macarellus* the mouth is small, jaws without noticeable teeth. The scutes are reduced, occupying only the posterior half of the straight part of lateral line, and preceded by about 90, usually more, scales; the occipital triangle is scaled.

It differs from *macarellus* (Atlantic) and *pinnulatus* (Pacific) in less slender body, fewer scales and fewer dorsal rays.

The present collection contains only eight specimens referable to this form, five of 95 to 113 mm. from Menado, North Celebes, one of 173 mm. probably from Celebes (label detached), two of 270 and 290 mm. from the coral reef at Batavia. These two large ones do not match the others in some characters, but one can be reasonably certain their differences are due to size. Otherwise the eight are homogeneous, little variable. Dorsal soft rays, 29 to 32 (average 30)-1; anal, 25 to 27 (26.7¹/₂)-1. Eighty-eight to 100 (93) scales, followed by 21 to 28 (25) scutes, totaling 115 to 123 (118). The end of the maxillary is straight, slanting more or less upward and backward, most slanting in the two largest. The 173 mm. specimen is very dark above, pale below in a sharp line from the level of the center of scutes, numerous conspicuous dark specks on the sides below this. The dark of the top of the head extends onto the tip of the mandible; pale, punctulate with dark (especially below the eye), extends up-

ward on the face and maxillary. A distinct opercular spot on the membrane. Inside of gill-cover dusky with darker punctulations. The small specimens are colored the same, except that the opercular spot is sometimes not distinct. Inside of gill-cover pale to dusky, but with punctulations present, as they also are on sides. The large specimens, which are faded, are less contrastingly dark above and pale below; inside of gill-cover pale, varyingly dusky behind, without punctulations, and none on the sides.

Lengths, 95 to 113 mm. to base of caudal (5 specimens). Depth, 5 to 5.5 (average 5.2); head, 3.9 to 4 (3.98). Eye in head, 3.7 to 4 (3.84); maxillary, 2.8 to 3.1 (2.98); width, 2 to 2.5 (2.2); pectoral, 1.6 to 1.7 (1.62). Straight part lateral line in curve, 1.1 to 1.4 (1.22). Lower jaw slightly projecting; maxillary to or not quite to under front rim of eye; the line of its end directed toward front part of eye or front rim of pupil. Scales on top of head to opposite middle of eye.

Length, 173 mm. (1 specimen). Depth, 5.5; head, 4.2. Eye, 4; maxillary, 3.1; width, 2.1; pectoral, 1.6. Straight part lateral line in curve, 1.4. Lower jaw slightly projecting, maxillary not quite to under front rim of eye; the line of its end directed toward front part of eye. Scales on top of head to before middle of eye.

Lengths, 270 and 290 mm. (2 specimens). Depth, 4.7 to 4.8 (4.75); head, 4. Eye, 4.5 to 4.6 (4.55); maxillary, 3 to 3.2 (3.1); width, 1.7 to 1.9 (1.8); pectoral, 1.4. Straight part lateral line in curve, 1.4. Jaws subequal, maxillary definitely not reaching to under front of eye; the line of its end toward mid pupil. Scales on top of head to before middle of eye.

KEY TO EAST INDIAN *Decapterus*

- (1) Scutes occupying entire straight part of lateral line, 29 to 38, preceded by 50 to 64 scales. Deeper, depth usually between 4 and 5. Teeth in jaws more or less noticeable.....See (2).
- Scutes occupying more than half but less than entire straight part of lateral line, 25 to 34, preceded by 75 to 94 scales. No noticeable teeth.....See (3).
- Scutes reduced, occupying only the poster-

- ior half of straight part of lateral line, 21 to 28, preceded by about 90 to 100 scales. No noticeable teeth. Usually darker above than other forms. Young of 170 mm. and less with characteristic dark punctulation on sides and below eye.....*macrosoma*.
- (2) Deeper and more compressed, width rather more than 1.75 in depth, between 150 and 200 mm. Anal soft rays, 20 to 24-1. Scales on top of head reaching to front part or front rim of eye (specimens 150 mm. and over).....*kurroides*.
Less compressed, width rather less than 1.75 in depth, between 150 and 200 mm. Anal soft rays, 24 to 28-1. Scales on top of head reaching to or behind the middle of eye (specimens 190 mm. and under).....*russellii*.
- (3) End of maxillary squarish, little if at all concave. Scales on top of head extend to opposite front part of eye, at least in specimens of 220 mm. or more...*muroadsi*.
Lower corner of end of maxillary more or less rounded and produced backward so that the end is more or less concave. Scales on top of head extend only to opposite hind part of eye in large specimens, those in the center usually to behind eye in specimens of 155 mm. or less.....*lajang*.